

REMARKS

I. Introduction

With the cancellation herein without prejudice of claims 18 and 19, claims 9 to 17 and 20 to 22 are pending in the present application. In view of the foregoing amendments and the following remarks, it is respectfully submitted that all of the presently pending claims are allowable, and reconsideration is respectfully requested.

II. Information Disclosure Statement

As regards the allegedly non-compliant information disclosure statement filed on June 16, 2005, a Supplemental Information Disclosure Statement is submitted herewith, which cites WO 02/055450. Therefore, it is respectfully requested that this document be considered.

III. Objection to the Specification

The Specification was objected to for various alleged informalities and alleged failure to provide proper antecedent basis for claimed subject matter.

Regarding the objection to the reference to Nb as a rare earth metal, it is respectfully submitted that this reference constitutes a syntax error, and the term "Nb" on page 3, line 31 of the Specification has been changed to --Nd--. No new matter has been added.

Regarding the objection to the term "PZT-based," the phrase "Lead-zirconate titanate ceramics $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$, modified by certain additives (PZT)" on page 1, lines 22 to 23 of the Specification has been changed to --Lead-zirconate titanate ceramics $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$ (PZT), modified by certain additives-- for clarification purposes. No new matter has been added. It is respectfully submitted that the term "PZT-based piezoelectric ceramics" on page 1, line 28 of the Specification is sufficiently clear to one skilled in the art, means ceramics having a chemical formula $\text{Pb}(\text{Zr}_{1-x}\text{Ti}_x)\text{O}_3$ as a basis, and sufficiently defines the composition of the above-mentioned ceramics.

Regarding the objection to the term "doped," it is respectfully submitted that this term is sufficiently clear to one skilled in the art.

Regarding the objection to the term "RB-doping," it is respectfully submitted that "RB-doping" relates to the doping described from column 3, line 23 to column 4, line 19 of U.S. Patent No. 6,773,621.

As regards the alleged lack of antecedent basis for claims 18 and 19, which have been canceled and whose features are now incorporated in claim 9, the Examiner will note that the subject matter of canceled claim 6 has been incorporated into the Specification in the paragraph beginning on page 3, line 9.

In view of all of the above, withdrawal of these objections is respectfully requested.

IV. Rejection of Claims 16, 17 and 22 Under 35 U.S.C. § 112, First Paragraph

Regarding the rejection of claims 16 and 17 under 35 U.S.C. § 112, First Paragraph, as indicated on page 5, line 28 to page 6, line 2 of the Specification:

It has been furthermore found that, in the case of PZT compositions doped using combinations of the elements Ca, La, Nb, Fe, Cu, the sintering temperature is not only lowered by at least approximately 100°C, but the electromechanical properties are also improved significantly. The elongation values, which are measured, for example, when a 2 kV/mm electrical field is applied, increase by an order of magnitude of up to 25%... .

In addition, the table on page 6 of the Specification cites a number examples of improved elongation values obtained when practicing the methods as recited in claims 16 and 17. Furthermore, the scope of enablement must only bear a "reasonable correlation" to the scope of the claims. *In re Fisher*, 427 F.2d 833, 839, 166 USPQ 18, 24 (CCPA 1970). Accordingly, it is respectfully submitted that the Specification does enable one skilled in the art to practice the subject matter as claimed in claims 16 and 17 without undue experimentation.

As regards the rejection of claim 22 under 35 U.S.C. § 112, First Paragraph, the Examiner will note that claim 22 has been amended to change "motor vehicle injection system" to --motor vehicle fuel injection system--. It is respectfully submitted that the knowledge in the art of ceramic piezoelectric actuators and their use in motor vehicle fuel injection systems, combined with the discussion in the Specification of multilayer ceramic actuators and multilayer ceramic actuators for fuel injection systems on page 2, lines 13 to 18 and page 4, lines 14 to

30, enable one skilled in the art to practice the subject matter of claim 22 without undue experimentation and reasonably convey to one skilled in the art that the inventors had possession of the subject matter of claim 22 when the application was filed.

In view of all of the foregoing, withdrawal of this rejection is respectfully requested.

V. Rejection of Claims 9 to 22 Under 35 U.S.C. § 112, Second Paragraph

Claims 9 to 22 were rejected under 35 U.S.C. § 112, Second Paragraph, as allegedly indefinite. It is respectfully submitted that claims 9 to 22 are sufficiently definite for at least the following reasons.

As an initial matter, the Examiner will note that claim 9 has been amended without prejudice to incorporate the features of claims 18 and 19, and claims 18 and 19 have been canceled without prejudice. Accordingly, the rejection of claims 18 and 19 will be addressed with respect to claim 9.

As regards claim 9, the ions that are mixed are provided by the powdered oxides or powdered carbonates used as starting compounds. The actual ions employed depend on the powdered oxides or powdered carbonates used. In addition, the features of now-canceled claims 18 and 19 incorporated into claim 9 have been amended to change the term "employed" to --obtained--, thereby eliminating any possible assumption of the presence of a sintering step.

As regards claim 10, contrary to the contentions appearing on page 4, lines 6 to 8, a salt is a product composed of one or more cations and one or more anions. In the case of lithium carbonate and lithium nitrate, both of these salts contain lithium in ionic form.

As regards claim 11, support for the term "PZT compounds" is found on page 1, lines 22 to 24 of the Specification. In addition, the term "simply doped" is an alternate expression for "mono-doped." Furthermore, the term "PZT-based piezoelectric ceramic material" in claim 9 implies a piezoelectric ceramic material having a PZT base or PZT base material.

As regards claim 12, claim 12 has been amended without prejudice to change "Nb" to --Nd--.

Claims 13 and 15 are sufficiently definite for at least the reasons set forth above in support of claims 9, 10 and 11.

Claim 14 is sufficiently definite for at least the reasons set forth above in support of claims 9 and 11.

As regards claims 16 and 17, it is respectfully submitted that these claims refer to a low-sintering piezoelectric ceramic material, but not a specific sintering step.

Claim 20 has been amended without prejudice to change "employed" to --obtained--, thereby eliminating any possible assumption of the presence of a sintering step.

As regards claims 21, this claim has been amended without prejudice to change its dependency to claim 9.

Claim 22 has been amended without prejudice to change "motor vehicle injection system" to --motor vehicle fuel injection system--, thereby clarifying the type of injection system encompassed. Support for this amendment may be found, for example, on page 4, lines 14 to 19 of the Specification. In addition, it is respectfully submitted that it is clear that an entire motor vehicle fuel injection system is claimed.

In view of all of the foregoing, withdrawal of this rejection is respectfully requested.

VI. Rejection of Claims 9 to 13 Under 35 U.S.C. § 102(b) ("Cheng et al.")

Claims 9 to 13 were rejected under 35 U.S.C. § 102(b) as anticipated by the article "The properties of low-temperature fired piezoelectric ceramics" ("Cheng et al."). It is respectfully submitted that Cheng et. al do not anticipate claims 9 to 13 for at least the following reasons.

As an initial matter, claim 11 has been amended to correct a syntax error.

Although Applicants may not agree with the merits of the rejection, to simplify matters, claim 9 has been amended without prejudice to substantially incorporate the features of claims 18 and 19. Specifically, claim 9 as amended recites, in relevant part, that **a sintering temperature in the range of 850°C to 950°C is obtained for the mixture of calcined starting compounds and ionic lithium.**

Cheng et al. do not disclose, or even suggest, the above-mentioned feature of claim 9. Cheng et al. do describe a ceramic made of a mixture of the starting materials PbO, ZrO₂, TiO₂ and Nb₂O₅, and doped with MnO₂. The mixture is calcined, and 0.5 wt% Li₂O₃ is then added to the calcined mixture. **However, Cheng et al. obtain a sintering temperature of 1070°C, which is not in the range of 850°C to 950°C required by the feature of claim 9.** Accordingly, it is respectfully submitted that Cheng et al. do not anticipate claim 9 for at least these reasons.

As regards claims 10 to 13, which ultimately depend from claim 9 and therefore include all of the features of claim 9, it is respectfully submitted that Cheng et al. do not anticipate these dependent claims for at least the reasons set forth above in support of the patentability of claim 9.

In view of all of the above, withdrawal of this rejection is respectfully requested.

VII. Rejection of Claims 9 to 13 Under 35 U.S.C. § 102(b) ("Jang et al.")

Claims 9 to 13 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,993,895 ("Jang et al."). It is respectfully submitted that Jang et al. do not anticipate claims 9 to 13 for at least the following reasons.

Jang et al. do not disclose, or even suggest, the features of claim 9 of mixing together ions added in the form of powdered oxides or powdered carbonates as starting compounds, and calcining the starting compounds to form the piezoelectric ceramic material. Jang et al. do utilize a PLZT ceramic made of lead, lanthanum, zirconium and titanium constituents, but do not describe how the ceramic is made. In addition, Jang et al. do not disclose, or even suggest, the feature of claim 9 that a sintering temperature in the range of 850°C to 950°C is obtained for a mixture of calcined starting compounds and ionic lithium. Jang et al. do describe mixtures of a PLZT powder and lithium nitrate, but these mixtures were disclosed to obtain sintering temperatures of 1000°C and 1100°C, and not 850°C to 950°C as required by the feature of claim 9. Accordingly, it is respectfully submitted that Jang et al. do not anticipate claim 9, as well as claims 10 to 13 dependent from claim 9, for at least these reasons.

In view of all of the foregoing, withdrawal of this rejection is respectfully requested.

VIII. Rejection of Claims 9 to 13 Under 35 U.S.C. § 103(a)

Claims 9 to 13 were rejected under 35 U.S.C. § 103(a) as unpatentable over Jang et al. It is respectfully submitted that Jang et al. do not render unpatentable claims 9 to 13 for at least the following reasons.

As discussed above in section VII of this response, Jang et al. do not disclose, or even suggest, the feature of claim 9 that a sintering temperature in the range of 850°C to 950°C is obtained for a mixture of calcined starting compounds and ionic lithium. Jang et al. are only able to obtain sintering temperatures of 1000°C and 1100°C. As silver is less expensive than palladium and has a relatively low melting point of approximately 960°C, the lower sintering temperatures of claim 9 are significant in that they allow for the production of an electromechanical multilayer component having electrodes made of an Ag/Pd mixture of considerably greater than 70% Ag, or even pure silver. Accordingly, it is respectfully submitted that Jang et al. do not render unpatentable claim 9, or claims 10 to 13 dependent from claim 9, for at least these reasons.

In view of all of the foregoing, withdrawal of this rejection is respectfully requested.

IX. Conclusion

In light of the foregoing, Applicants respectfully submit that all pending claims are in condition for allowance. Prompt reconsideration and allowance of the present application are therefore earnestly solicited.

Respectfully submitted,

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